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Beiträge zur experimentellen Psychologie. HUGO MÜNSTERBERG.
Heft 1. Freiburg (J. C. B. Mohr) 1889. 8vo. pp. 188. 4 mks.

Dr. Münsterberg, a docent in philosophy at the University of Freiburg, announces a series of publications (of which this is the first installment) similar to the studies from Wundt's laboratory, with the exception that Dr. Münsterberg personally takes part in all the experiments and himself writes up the results. He hopes to publish about three numbers a year, and the new adventure certainly deserves a hearty encouragement, especially considering that the laboratory in which the studies are made is a private one without governmental endowment. It may as well be said first as last that the chief defects of these contributions (a defect perhaps equally prominent in Wundt's *Studien*) is the undue prolixity of the treatment, that so buries the real objects of worth as to give almost as much credit to the one who digs successfully into the heap as to him to whom it owes its origin. The complete results obtained by Dr. Münsterberg could have been forcibly stated in a maximum of seventy-five pages, with at the least doubling the number of his readers, and increasing ten-fold the appreciation of his work. It would perhaps be irrelevant to emphasize this point were it not that psychology has suffered from this weakness so severely in the past and will not gain its proper place amongst the sciences until it gives its results a truly scientific form.

Of the two studies here presented the first states the author's position on the general relations of body and mind, while the second gives an account of some ingenious experiments upon the time-relations of mental phenomena under the misleading title of "conscious and unconscious combinations of perceptions (*Vorstellungsverbindungen*)."

The former is a somewhat complicated statement of the modern "psychophysics" view of the mutual influence of physical and psychical conditions with special reference to the factors of apperception and consciousness in the process. The train of thought is much broken into by digression (particularly of a controversial nature against Wundt) and is only indirectly concerned with the experiments, although the author tells us that his guiding *motif* was to throw light on the relation of the subject that watches and records mental operations to that other subject that in part with, and in part without consciousness elaborates them.

The experimental contributions fall into two parts, the facts brought out in them being the following:— (1) Following out the distinction established by Lange between a "sensory" mode of reaction (in which the attention is concentrated upon the expected stimulus) and the "motor" form (in which the attention is fixed upon the intended movement), Dr. Münsterberg measures the reaction-time to a sound with each of the five fingers with each form of reaction, and finds on the average a sensory time of 162 σ and a motor time of 120 σ ($\sigma = .001$ second), a difference of 42 σ , considerably less than Lange's (100 σ). (2) Next, the words one, two, three, four, five were called out irregularly, and the thumb, forefinger, etc., were to be raised when the corresponding number was called. Sensory time, 383 σ ; motor, 289 σ . (3) The process remains the same, but the Latin declension *lupus, lupi, lupo, lupum, lupe*, is substituted for the number words, evidently a more artificial association. Sensory time, 465 σ ; motor, 355 σ . (4) The movements of the five fingers are associated with the cases of the three following German pronouns, *ich, meiner, mir, mich, wir*; or *du, deiner, dir, dich, ihr*; or *der, des, dem, den*,

die, the same reaction following to any one of three stimuli. Sensory time, 688 σ ; motor, 430 σ . Errors, *i. e.*, raising the wrong finger practically never occurred up to this time; from here on they occur, but only in the motor reactions, and always consist in the raising of a neighboring finger. In the present case the errors form 10 per cent. of the reactions; the second finger being frequently raised to *du* apparently from its place in the series, *ich, du, er*. (5) The process becomes more general; if a noun is called, the thumb is to respond; if an adjective, the next finger; if a pronoun, the next; if a number, the next; and if a verb, the little finger. The words are all monosyllabic; no word occurs twice, and the general association of parts of speech with fingers is well learned in advance. Sensory time, 712 σ ; motor, 432 σ ; errors, 30 per cent. (6) The process remains the same, the categories being respectively, a city, a river, an animal, a plant, an element. Sensory time, 893 σ ; motor, 432 σ ; errors, 12 per cent. (7). The categories are an author, a musician, a naturalist, a philosopher, a statesman or general. Sensory time, 1122 σ ; motor, 437 σ ; errors, 25 per cent.

This remarkable and rapidly increasing difference between a sensory and a motor reaction demands a more complete explanation in the light of the facts just presented. After spending a needlessly long argument in showing that Wundt's apperception theory fails to explain the facts, Dr. Münsterberg concludes that in the sensory apperception we attend to one step at a time, allowing each factor to pass through the mind *seriatim*, (and thus sensory reactions remain a trustworthy test of mental complexity); but that in the motor times we have a distinct overlapping of mental processes, the mechanism being a short circuit between the finger-moving centers and the particular word called, the processes of recognizing the word as belonging to a certain category, and that category as associated with a certain finger not emerging in consciousness and being performed simultaneously with the other process. This process would be about the same in cases (4) to (7) and these give about the same motor, through vastly different sensory times. In other words, motor complexity is a different matter from sensory complexity, and a comparison of the gradual increase of each time from (1) to (7) will reveal many suggestive points, with reference to which every theory of association or perception must be built.

The second study is upon the association of ideas. There are two subjects, *M* and *R*, who react by pressing a key in pronouncing their reply-word, while Dr. Münsterberg had pressed the key in speaking the last syllable of the call-word or the call-sentence. Besides the times the average variation (*v*) is given.

(1) Simple repetition of the call-word occupies *M*, 403 σ (*v*. 60 σ) and *R*, 362 σ (*v*. 70 σ). (2) Ordinary association-time for *M*, 845 σ (*v*. 140 σ); *R* 948 σ (*v*. 170 σ). (3) A limited association, the general type being, "Given a general term to name an instance under it." The kind of relation was constantly varied, such as, "A German wine, Rudesheimer," "A Greek poet, Homer," etc. *M*, 970 σ (*v*. 200 σ); *R*, 1103 σ (*v*. 210 σ). (4) An association limited to a single answer, after the pattern of question and answer: *e. g.*, "On what river is Cologne? Rhine." "In what season is June? Summer." *M*, 808 σ (*v*. 180 σ); *R*, 889 σ (*v*. 140 σ). (5) The answer is now the result of comparison and judgment; *e. g.*, "Which is larger, a lion or mouse?" "Who is greater, Homer or Kant?" *M*, 906 σ (*v*. 180 σ); *R*, 1079 σ (*v*. 220 σ). (6) Same as (5), but each query is preceded by a series

of about a dozen words of the same category as the terms compared. Thus: "Apples, pears, cherries, nuts, peaches, grapes, strawberries, dates, figs, raisins,—which do you like better, grapes or cherries? Cherries." *M*, 694 σ (v. 130 σ); *R*, 659 σ (v. 160 σ),—a shortening of 212 σ and 460 σ as compared with (5). (7) A combination of (3) and (6); instead of first asking for a drama of Goethe's, and then asking which is the finest, this, that or the other, we ask at once, "Which is the finest drama of Goethe?" *M*, 962 σ (v. 180 σ); *R*, 1137 σ (v. 160 σ). (8) This is a comparison between a given term and a term derived by process (7); thus, "Which is the more westerly, Berlin or the most important German river? Rhine." *M*, 1844 σ (v. 370 σ); *R*, 1866 σ (v. 340 σ). (9) Bears the same relation to (8) that (7) does to (4); the type of query being, "Which lies more westerly, Berlin or the river on which Cologne is situated?" *M*, 1291 σ (v. 180 σ); *R*, 1337 σ (v. 230) or 553 σ and 529 σ less than (8) while (7) is only 154 σ , 248 σ less than (4). (10) is (9) preceded by a series of terms of the same category as those to be compared. *M*, 1153 σ (v. 170); *R*, 1145 σ (v. 210), or 138 σ and 192 σ less than (9). The results are based upon 890 experiments in all.

After again fiercely combatting Wundt's apperception theory in its relations to these results, Dr. Münsterberg attempts their interpretation, in which the four following relations may be selected as most important: (a) that the time of a free association is shorter than of a limited association, (2) shorter than (3); (b) the question-answer association is shorter than the limited, (4) than (3); (c) that the reading of the series of words before the question shortens the time, (6) is shorter than (5) and (10) than (9); (d) the combination of any two or three factors in the same process takes less time than the sum of the times needed for each of the factors separately; compare (9) with (3) and (5). Relation (a) is not new and is readily explained by considering that in one case *any* association aroused by the call-word will answer, while in the other case several associations may arise that must be rejected. Fact (b) seems to indicate that we do not call up first the general notion and then the particular, but seem to have a direct and usually prominent association with the particular, the irrelevant general association not being "apperceived." The third fact indicates the mechanism of preparation, certain general lines of association being already ruled out by the formation of the category-series, and thus less of the mental labor comes into the measured time. The fourth circumstance shows again the overlapping of mental processes; the mind is not a point through which each process must pass in turn, but is a plane in which the most complex interactions have play. For the acceptance and further development of the interesting results of these studies we must look to the future.

J. J.

L'Énergie et la Vitesse des Mouvements Volontaires. CH. FÉRÉ. *Revue Philosophique.* Juillet, 1889.

In this paper Dr. Féré gathers up the results of a number of brief studies, for the most part reported during the past year in the *Comptes rendus de la Société de Biologie*. Beginning with pathological subjects, he shows that the reaction-time of hysterical hemianæsthesics is generally longer than normal (and, as some of his experiments seem to show, the rate of nervous transmission on the diseased side slower) when the diseased side has part in the pro-